

PATENT COOPERATION TREATY
PCT
INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)



REC'D 07 MAR 2005

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Applicant's or agent's file reference HJFI20022023	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/FI 03/00851	International filing date (day/month/year) 10.11.2003	Priority date (day/month/year) 13.11.2002
International Patent Classification (IPC) or both national classification and IPC G05B17/02		
Applicant METSO PAPER, INC.et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 6 sheets, including this cover sheet.
- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).
- These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:
- I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain documents cited
 - VII ☐ Certain defects in the international application
 - VIII ☐ Certain observations on the international application

Date of submission of the demand 08.06.2004	Date of completion of this report 03.03.2005
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Henrikson, O Telephone No. +49 89 2399-2734 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/FI 03/00851

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-13 as originally filed

Claims, Numbers

1-14 filed with telefax on 28.10.2004

Drawings, Sheets

1/4-4/4 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☒ the claims, Nos.: 15,16
☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY
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International application No. **PCT/FI 03/00851**

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-14
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	1-14
Industrial applicability (IA)	Yes: Claims	1-14
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

The following documents have been cited in the international search report:

- D1: US-A-5 308 010 (HAKIEL ZBIGNIEW) 3 May 1994 (1994-05-03)
- D2: WO 99/50719 A (LIEPOLD HELMUT ;SIEMENS AG (DE); SCHAEFFNER CLEMENS (DE); WIENHOLT) 7 October 1999 (1999-10-07)
- D3: MARKO JORKAMA: "MECHANICAL ENGINEERING SERIES" [Online] ACTA POLYTECHNICA SCANDINAVICA 146 , XP002274522 Retrieved from the Internet: URL:[http://lib.hut.fi/2001/isbn9512257033/ isbn9512257033.pdf](http://lib.hut.fi/2001/isbn9512257033/isbn9512257033.pdf)> [retrieved on 2004-03-23]
- D4: US-A-5 470 005 (KING EUGENE O ET AL) 28 November 1995 (1995-11-28)
- D5: US-A-5 967 450 (COLE KEVIN A ET AL) 19 October 1999 (1999-10-19)
- D6: US-B-6 363 2971 (LIEPOLD HELMUT ET AL) 26 March 2002 (2002-03-26)

1. Considering the general broad scope and unclear definition the subject-matter claim 1 appears not to meet the criteria of inventive step in the sense of Article 33(3) PCT.

Document D1 discloses, particularly in column 8, line 63 - column 9, line 14, the preparation of a winding recipe where, based on a model, the running parameters are determined.

In D2 controlling of a wind-up involves preparation of a winding quality (German: Wicklungsgüte) which would correspond to winding recipe and comprises winding parameters. Based on models N_i and W_i for the nip and the drum running parameters are determined - page 9, line 26 - page 11, line 33.

WOT, defining the web tension, is referred to in D3, e.g. page 13, and an iterative process is suggested in D2, page 10, line 30 - page 11, line 5, for achieving optimal winding conditions.

In view of the unclear definition of the subject-matter of claim 1, no features appears to constitute subject-matter which the skilled man, having regard to the teaching in D1 and D3, and within his customary practice would not be incited to propose in optimising a the process of D2.

2. Since in D2 the quantity web strength FAW used in the determining the winding quality is a function of the radius of the cumulated paper on the sleeve or winding core, the subject-matter of claim 2 would not involve an inventive step in the sense of Article 33(3) PCT. Since the web strength would correspond to a WOT curve, the features of claim 3 would not constitute support for an inventive step.
3. In view of the very unclear wording of the claims, no inventive step can be attributed to the further subject-matter of claims 5 - 14.
4. The application does not meet the requirements of Art. 6 PCT in combination with Rule 6.3(b) PCT. The reasons are the following:
Generally, the method of claim 1 is unduly broadly formulated and does not appear to define all features required for the defining the invention as disclosed.
 - 4.1 From the application as a whole, it would appear that the invention relates to a method of determining a winding recipe for a roll of web, which winding recipe is to be used later when the web is being unwound to be used by an end user, this determination being made when controlling the wind-up of the web on the roll, e.g. in a slitter process.
 - 4.2 Moreover, the following observations are made:
Claim 1 relates to a method for controlling a wind-up. However, no steps of control are defined in the claim.
The generally worded claim expresses that running parameters of the wind-up are determined, such that the roll will withstand later unwinding. This definition of the determination of the running parameters only sets forth a purpose for the determination of the parameters and does not include any method step indicating how the running parameters are determined. Besides, it would be obvious that the roll shall withstand unwinding.

The calculatory and/or experimental models will have to be defined in more detail. It is not comprehensible how the running parameters can be determined "before the run".

Claim 1 also calls for the following observations for lack of clear definition:

The winding recipe is insufficiently defined. In this context it is not clear if the running parameters correspond to the winding parameters.

It is not clear how the various models are used in the unwinding process?

It is not clear which are the starting data and how this data is used for forming the winding recipe.

It is not clear on the basis of which parameter or condition the iteration of the WOT-curve takes place?

The WOT-curve should be defined.

The stresses in the roll requires elucidation.

It is not clear how the estimation of roll damage is made and what kind of damage is meant.

4.4 In claims 3 and 4 the unwinding model and the winding model are not defined by an antecedent.

In claim 5 the calculatory model is mandatory, for which reason this model shall be mandatory also in claim 1.

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ART 31 AMOT

Claims

1. Method for controlling a wind-up, the method comprising the step of preparing a winding recipe (13) of a roll, which winding recipe comprises winding parameters, **characterized** in that the method comprises the step of determining, based on calculatory and/or experimental models (23), running parameters of the wind-up before the run such that, based on the models (23), the roll will withstand unwinding (24) taking place in an end-use device without being damaged.
2. Method according to claim 1, **characterized** in that the method comprises the step of determining the running parameters of the wind-up such that, based on models (14), the roll will withstand winding (15) taking place in the wind-up.
3. Method according to claim 1 or 2, **characterized** in that the winding recipe is determined as a function of the diameter or radius or the degree of thickness of the cumulated paper on the winding core or as a function of wound web length or the number of laps of the wound web.
4. Method according to any one of claims 1 - 3, **characterized** in that the method comprises the steps of selecting a WOT (Wound-On-Tension) curve (12) on the basis of starting data (11), by means of which curve the winding recipe (13) is determined such that the recipe (13) gives a $WOT_{ref}(D)$ reference curve according to the selected WOT curve and checking, by means of the unwinding model (23), that the rolls will withstand end-use without being damaged (24).

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ART 17

5. Method according to any one of claims 1 - 4, **characterized** in that, by means of the winding model (14) it is checked, that the rolls will withstand the winding (15).
- 5 6. Method according to any one of claims 1 - 5, **characterized** in that the method comprises the steps of carrying out initialization (22) of iteration of the WOT curve for selection of the WOT curve (12) and calculating stresses and relaxation of the roll as well as determining, on the basis of the calculatory model (23), whether the roll will be damaged during end-use and selecting a WOT curve ensuring damage-free end-use (24) of the roll.
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7. Method according to any one of claims 1 - 6, **characterized** in that the method comprises the steps of carrying out, based on a WOT model (33), initialization (32) of iteration for selection of the winding recipe (13) and ensuring that the selected WOT curve corresponds to the WOT reference curve and bringing the selected winding recipe into use.
- 15
8. Method according to any one of claims 1 - 7, **characterized** in that, during running of the wind-up, a selected winding recipe (42) is loaded into use and, during running, it is monitored whether the measured WOT curve is realized corresponding to the WOT reference curve and, if necessary, a selected winding recipe (46) is corrected.
- 20
9. Method according to any one of claims 1 - 8, **characterized** in that the method comprises the steps of measuring internal stress distribution (44) of the rolls and/or calculating, by means of the load model (14), forces directed to the roll during winding and estimating, by means of the model (23), the relaxation of the internal stresses of the roll during transportation as well as calculating, by means of the load model (23), forces directed to the roll in the pa-
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ART 238C IT

per mill customer's finishing device, thereby providing, by means of the model (23), a runnability prediction for the end-use of the roll and determining, on the basis of the model (14, 23) the winding recipe (13) providing damage-free end-use runnability in the finishing device.

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10. Method according to any one of claims 1 - 9, **characterized** in that the method comprises the steps of determining the starting data (11), based on which the winding recipe (13) is formed, which winding recipe is iterated by iterating the WOT (Wound-On-Tension) curve (12), of calculating the stresses of the roll and the relaxation (23) of the roll stresses, and, on the basis of the model (23), estimating whether the roll will be damaged and, if necessary, generating a new WOT curve (25) and determining the winding recipe (13) with the help of the WOT model, on the basis of which winding recipe (13) the wind-up (15) is controlled.

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11. Method according to any one of claims 1 - 10, **characterized** in that, during running of the wind-up, it is monitored whether a generated WOT (45) curve is realized and, if necessary, the winding parameters (46) are corrected such that the measured WOT curve corresponds to the estimated WOT curve.

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12. Method according to any one of claims 1 - 11, **characterized** in that the iteration of the winding recipe (13) in each run is continued and, if necessary, a new WOT curve is determined upon change of paper grade.

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13. Method according to any one of claims 1 - 12, **characterized** in that the method comprises the steps of
- a) indirectly measuring, in three or two dimensions, the internal stress distribution (44) of the roll being wound up

- 5
- b) calculating by means of the roll load model (14) the internal stresses caused by forces directed to the roll during winding,
 - c) estimating (23) the relaxation of the internal stresses of a finished roll before the roll is processed in the paper mill customer's finishing device, and
 - d) calculating by means of a roll and unwinding device load model the stresses and displacements directed to the roll during unwinding (23).

10 14. Method according to any one of claims 1 - 13, **characterized** in that in the method the starting data (11) on the paper grade are obtained through off- and on-line measurements of paper processing equipment preceding the wind-up and through measurements of the slitter-winder itself.

15 15. Method according to any one of claims 1 - 14, **characterized** in that the limitations for the winding recipe (13) are determined on the basis of basic data obtained through physical properties of the winding device and through the load model (14).

20 16. Method according to any one of claims 1 - 15, **characterized** in that the method comprises the step of calculating, in structure models of the wind-up and the finishing device, slippages and/or other damage mechanisms generated within the roll.